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Inside . . .

Upgrading buildings doesn't always mean putting in new components. Sometimes, equally satisfactory results can be achieved with repairs and retrofits. Tony Woods tells us about re-trofit weatherstripping of windows in existing buildings.

Indoor air quality concerns are getting much attention. We present some findings from a NASA study showing how we can put plants to work for us. For those into more substantial buildings, a new manual gives some strategies for investigating indoor air quality problems.

Other items include a description of research labs that look a combustion equipment, a report on the drying of wall assemblies which points out that wet lumber eventually dries out without creating problems, an update on the Advanced houses program, the latest from the TRC, and much more.

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Window Re-weatherstripping

From the Publisher . . .

We spend a lot of time dealing with regulations, be they building codes, product standards, or other voluntary rules. No one likes to be told what they must do. The concern becomes how much regulation is necessary, especially if they are to be mandatory.

The debate often becomes one of how far should regulations go. Often the discussion becomes one of haggling over nuts and bolts rather than basic principles of how far regulations should go.

The building industry is torn between two extremes. On the one hand, the attitude is to let the marketplace determine how building should be done, other than the most basic requirements for structural and health safety. On the other hand, once regulations are in place, they become the maximum standard by which construction takes place. If there are stringent regulations, everyone has to conform and quality builders don't have as difficult a time dealing with the low bidders at the bottom of the heap.

Unfortunately, the latter approach, especially in a very price sensitive market, makes it difficult for the quality builder to introduce upgrades and the purchaser does not get the benefit of better, longer lasting quality (the home buyer often doesn't have the knowledge on which to make adequate decisions).

I think we are missing an important sector when discussing regulations if the financial sector is not involved. Like it or not, financial institutions have as important an impact as building regulations by what they will and will not finance.

If we want to encourage improvements, using the carrot rather than a stick, then bankers must be brought on side. Too often they don't know what's good building practice to create a healthy, durable housing environment, or are simply unwilling to provide adequate financing for it.

The financial agency that should be the trend setter is Canada Mortgage & Housing Corporation. CMHC is a major banker, especially to the social housing sector as well as being the principal housing research agency, repository of the latest building information. One would think their research findings would be applied to projects they finance, and that they would insist that correct construction practices be followed.

But what is the reality? CMHC generally insists on a minimum capital cost solution, never mind the consequences, even though they often end up paying to repair and rebuild the damage due to inadequate construction as quickly as 2-3 years after construction. This kind of shortsighted approach does no one any good, and it does no help the professional builder to encourage a wider adoption of sound building technology.

Richard Kadulski
Publisher

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Editor-Publisher: Richard Kadulski
Illustrations: Terry Lyster
Contributors: Tony Woods, Jim White, Ken Farrish, Jeff Rockburn, John Broniak, Ross Monsour, Joe Chisholm, B.C. Wolverton, Bob Swartman
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Re-weatherstripping Old Windows: Better Than New Windows?

By Tony Woods

The cost of removing worn-out windows and installing new ones has never proved to be cost-effective in terms of energy savings. Expensive window replacement is usually justified on the basis of improved real estate value, aesthetics, or even the assumption that the old windows cannot be repaired.

Recent developments in weatherstripping techniques and testing methods, together with test results, have changed the equation. It is possible to salvage most types of operable windows at a cost that is justified by lower energy bills, longer window life, improved comfort and protection against rain penetration.

Uncomfortable drafts and water inside a building are the two most common factors when an owner decides whether or not an old window must be replaced. Recent before-and-after testing using portable equipment has shown that new techniques can create a window that outperforms both CSA and AAMA standards for air leakage and water penetration in new construction.

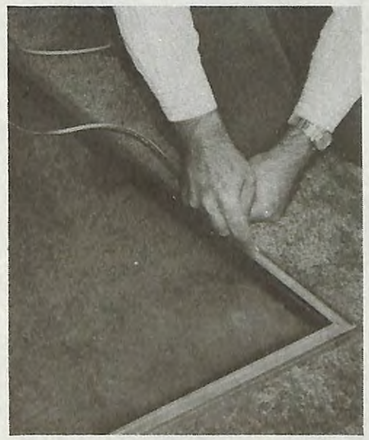
Re-weatherstripping techniques

The improvements recorded by one installer averaged more than a 60% reduction in air leakage and water penetration. Bill Boyd of CanAm Building Envelope Specialists Inc. says "testing has proved that air leakage and water penetration can be reduced to less than the new window standards requirement on most operable windows." His company is involved in researching building envelope improvement methods as well as using such techniques in both renovation and new construction, and has performed several successful window upgrades.

Several different types of operable windows can be found in most buildings. Boyd says that the new techniques have been used on aluminum sliders, sashless glass horizontal sliders and steel framed, factory sash casement windows.

Aluminum sliders of different kinds are by no means energy-efficient. Weatherstripping in this type of window typically consists of a low-pile cotton substance which deteriorates rapidly with use.

New techniques involve removing existing materials and putting in a polypropylene brush-type material with a plastic fin in the centre (*Schlegel Finseal*). Sometimes an additional 'dust-plug' is needed to deal with larger notches cut out of window meeting rails to allow for removal of sliders. Tests have recorded a reduction in leakage of up to 51% with these windows, and up to 75% on similarly-constructed patio doors.



Re-weatherstripping a window using modern pile type material incorporating a plastic film

Sashless glass horizontal sliders are a window style which was traditionally not weatherstripped at all. It has a plastic closure which traps it so that it cannot slide open without being pulled hard. It is commonly found on town houses and other types of row housing. Some of these windows have been updated with a piece of sash in the meeting rail (in a plastic track), so that they close better. Typically, the modern way of upgrading is to add a Polyflex preformed V-type vinyl extrusion. "Even when only the tops and the sides can be weatherstripped," says Boyd "leakage reduction of up to 74% has been achieved".

Historic buildings

Even very old leaded glass casement windows can be brought up to new standards cost-effectively. These windows are often warped, rusted and pitted, making the traditional gasket methods of weatherstripping impossible. In simple terms, the new technique consists of laying a bead of silicone caulking on the static frame part of the window where the operable part meets it. This bead is moulded to form an airtight seal by the action of closing the window.

Obviously, something has to be done to prevent the window from sticking closed after this procedure. To avoid this, first the installer cleans the surfaces to free them of grease, dust, flakes, dirt and rust particles; then the silicone bead is applied to the static frame. A release agent is then applied to the mating part of the operable

Caulking the static part of a casement window on an historic building

window which will contact the caulking.

The window is left closed for three days to allow the silicone to cure. It is then opened and the excess silicone trimmed. Test results showed a greater than 85% improvement after this method was used on Trinity College, an historic building at the University of Toronto.

Test methods

A special portable window kit for those who wish to perform their own tests is offered by Canadian Building Envelope Science and Technology (CanBest) of Brampton, Ontario, a company which has been very active in the window testing, both on site and in the laboratory.

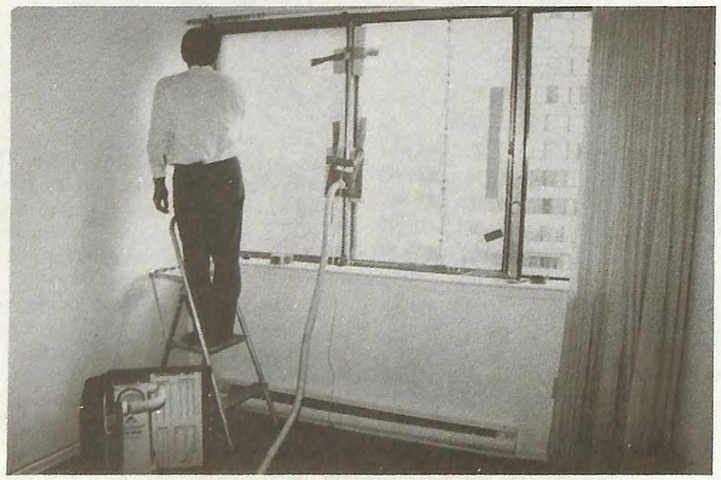
First, the window is isolated with transparent film, by sealing it and the frame on the inside; then the enclosed space is depressurized to create a positive pressure on the outside of the building. When testing for air leakage, the amount of air required to create a 75 Pascal pressure differential across the window indicates its ability to allow air to travel through the leaks. The leakier the window, the more air is needed. Elie Alkhoury says "this enables us to see if it meets the requirements of the standard or the client. It is generally a fairly accurate guide, the only limit being windy or rainy weather conditions, which can effect your results."

Water penetration tests are conducted in a similar way, except that windows are pressurized to a higher level and water is sprayed on the outside through a calibrated grid of nozzles. There is no measurement involved, it is simply a question of pass or fail at seven different levels of negative pressure in the space (from 150 to 700 Pascals).

Alkhoury's company is often called in to advise owners on the question of window repair or replacement. He says "initially owners want to find out if a window can be saved rather than be replaced. The potential for improvement is assessed, and, based on that, owners decide whether to go for retrofit".

The main things to look at are the structure of the window, its general integrity from an assembly point of view, the way it was originally installed, notably its continuity with the barrier system in the wall, as well as ways to improve its performance. If it is a flimsy, low quality window, or was improperly installed, replacement may be recommended.

If, on the other hand, it was soundly structured and installed reasonably well, but has inadequate or non-existent weatherstripping, it is a good candidate for retrofit. This is very common, especially in historic buildings, where replacement is not an option.



Testing aluminum sliders for air tightness using a portable kit

Energy cost savings.

According to Anil Parekh, from Scanada Consultants Ltd. of Ottawa and Oakville, Ontario, windows remain a weak point in the building envelope and are " probably the last big loser in energy, comfort and durability."

In a report prepared for Ontario Hydro, Scanada concluded that "air infiltration and ventilation have a profound influence on both the internal environment and on the energy needs of buildings. Unnecessary high air change rates present an excessive burden on the building's heating (or cooling) system, resulting either in an unnecessary waste of energy or in the inability of the heating or air conditioning system to satisfy thermal and comfort requirements.

"Problems relating to moisture migration, cold drafts and a generally uncomfortable living or working environment may also be experienced with high air leakages, so the control of air leakage in buildings has become a key element in achieving both energy conservation and indoor air quality."

In one demonstration project for Ontario Hydro, Scanada analyzed the potential reduction in peak electrical demand that could be achieved by reducing air leakage in different parts of an electrically heated 21 storey high-rise building in downtown Ottawa. Out of a total possible reduction of 83 kwh, 42%, or 38 kwh., was saved by reducing air leakage through the windows. All components of the building envelope were upgraded for air leakage control, including reweatherstripping the windows.

Tony Woods is Past President of the Ontario Building Envelope Council, 1991 recipient of that organization's 'Beckie' award for outstanding contribution to the industry, a Director of the National Energy Conservation Association, and a member of several CSA and CGSB committees. He is President of CanAm Building Envelope Specialists Inc., Mississauga, Ontario.

An easier and safer method for installing a roof ladder

The standard method of building and attaching roof ladders at gable ends is often difficult, time-consuming and potentially dangerous. This year's CMHC Job-site innovator award offers a system that is easier and safer than the standard construction method. The ladders can be built at floor level and passed up to the roof level and nailed into place. Both ends can be built and stood up at the same time.

After the exterior walls are in place and braced, nail the gable truss into place and brace with 2 x 4"s to the exterior wall. Mark out the top plates for truss locations. Before placing the first regular truss in position, lay it flat and support it if needed. Lift the ladders up from the ground or subfloor and nail them to this truss.

The fascia can also be nailed on at this time. Nail a clear neat the apex of the ladder to act as a temporary brace and to keep the joint tight. Lift the truss, align it with the center of the gable truss and nail in place. Nail lookouts to the top chord of the gable end truss.

The remaining trusses are now raised and aligned using a string guide. The fascia boards can be attached more easily and more safely using this technique.

This job site innovation was the winner of the 1991 Job Site Innovator Award sponsored by *Canada Mortgage and Housing Corporation (*CMHC). It was submitted by **Joe Chisholm** of Chisholm Contracting in Terrace, B.C.

Job-Site innovator Awards Program

CMHC encourages builders, renovators, and tradespeople to develop and share simple construction techniques that can make construction or renovation easier, faster or more cost-effective. These innovations must be new construction techniques that anyone in the building industry can use without special equipment or products.

Each year, CMHC and the Canadian Home Builder's Association recognize the best job-site innovations. These innovators are presented with Innovator of the Year Awards.

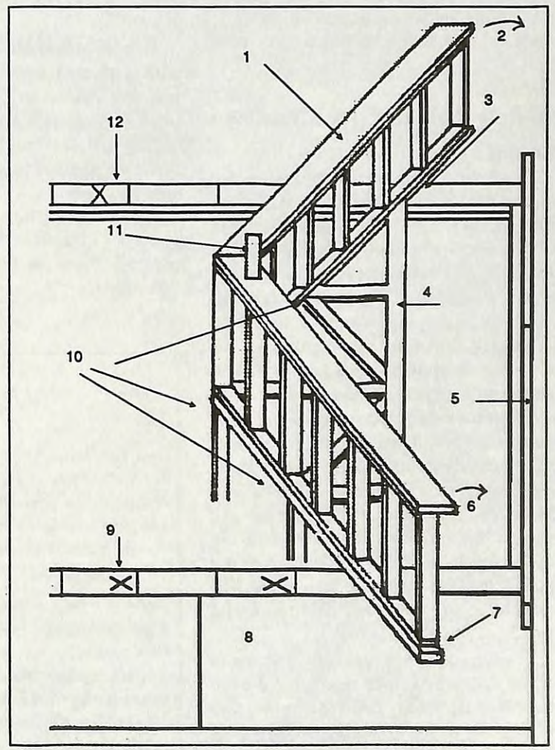


Figure 1. LADDERS ARE NAILED TO FIRST TRUSS AND HINGED OVER GABLE END.
Notes: 1. ladder; 2. ladder swings up to right; 3. hinge point; 4. roof truss; 5. standing gable truss; 6. ladder swings up to right; 7. 1"x4"; 8. wall sheathing; 9. top plate; 10. support truss here; 11. temporary clear; 12. top plate.

Plants to Fight Indoor Air Pollution

Synthetic building materials emit or "off-gas" a range of compounds that have been linked to many health complaints. Most environmental scientists and government agencies now agree that indoor air pollution is a threat to human health.

People are another source of indoor air pollution. In a closed, poorly ventilated area the problem is especially noticeable. This becomes very apparent when a large number of people are in a confined place such as an airplane, office or in a home during a very cold spell.

So how can the problem be solved?

The first and most obvious step in reducing indoor air pollution is to reduce off-gassing from building materials and furnishings before they are allowed to be installed. A clean indoor environment can be guaranteed if you don't put any furnishings and keep people out of the way. Obviously, that's not the solution, so we need to look at alternative approaches to managing the cleanliness of indoor air.

One promising approach to reducing levels of air pollutants indoors is the use of indoor plants. It may seem far fetched, something an environmentalist would dream up. However, it's real space age stuff - something that NASA is studying for use in space. If you think about it, it's no different than what happens everyday on earth, where the plants are an essential portion of the planet's lungs.

Findings of these studies have dribbled out in the past. Spider plants have been praised as especially good at filtering and making use of some common indoor pollutants, especially formaldehyde.

Low-light-requiring house plants, along with activated carbon plant filters, can improve indoor air quality by removing trace organic pollutants from the air in energy-efficient buildings. The plant root-soil zone appears to be the most effective area for removing volatile organic chemicals so maximizing air exposure to the plant pot area must be considered when placing plants in building for best air filtration.

However, the NASA studies have looked at the whole plant system as a possible means of reducing indoor air pollutants including the leaves, roots, soil and associated microorganisms. The air filter design combines plants with an activated carbon filter. *To be effective, it requires that large volumes of contaminated air are moved through an activated carbon bed where smoke, organic chemicals, and pathogenic microorganisms (if present) are absorbed by the carbon filter.* It's not as effective when the plants just sit there. The plant roots and their associated microorganisms destroy the pathogenic viruses, bacteria and other organic chemicals, eventually converting all of these pollutants into new plant tissue.

All plants tested were obtained from nurseries, kept in their original pots and potting soil, just as received from the nursery, and they were exposed to high concentrations of chemicals.

What plants are effective filters?

A range of plants were used in the NASA tests. Each is effective for differing compounds. Some of the more effective "plant filters" include:

Formaldehyde
Banana (*Musa oriana*)
Mother-in-law's tongue (*Sansevieria laurentii*)
English Ivy (*Hedera helix*)
Bamboo palm (*Chamaedorea seifrizii*)
Heart leaf philodendron (*Philodendron domesticum*)
Green spider plant (Chlorophytum elatum)

Benzene
Gerbera daisy *(Gerbera jamesonii)*
Pot mum *(Chrysanthemum morifolium)*
English Ivy *(Hedera helix)*
Mother-in-law's tongue *(Sansevieria laurentii)*
Warneckei *("Dracaena deremensis "warneckei")*

Trichloroethylene (TCE)
Gerbera daisy *(Gerbera jamesonii)*
English Ivy (*Hedera helix*)
Marginata (*Dracaena marginata*)
Peace lily (*Spathiphyllum "Mauna Loa"*)
Mother-in-law's tongue (*Sansevieria laurentii*)

Early tests showed that potting soil, after all foliage had been removed, was more effective in removing benzene than pots containing full foliage and soil. But when the same plants and potting soil are constantly exposed to air containing such toxic chemicals as benzene, their capacity to continuously clean the air improves. In part this happens because the microorganisms in the pot are able to adapt genetically, thus increasing their ability to use toxic chemicals as a food source when continuously exposed to such chemicals.

Activated carbon is an essential component in the development of an indoor air pollution control system with plants to remove high concentrations of pollutants such as cigarette smoke and organic solvents. A fan is needed to move large volumes of air through an activated carbon filter. The filter adsorbs air pollutants and holds them until the plant roots and microorganisms can use them as a food source.

Activated carbon filters containing fans have the capacity for rapidly filtering large volumes of polluted air and should be considered an integral part of any plan using house plants for solving indoor air pollution problems.

You may think that with the popularity of atriums in commercial buildings and shopping malls these lessons are already being applied. With an increased popularity of sunrooms it would seem we are applying these lessons to residential applications as well. Unfortunately, that ain't necessarily so.

Take a close look at the plants in your favourite mall, restaurant or commercial atrium. You'll be surprised how many are artificial in the interests of "ease of maintenance" (after all, you don't have to water silk plants!).

Chemicals Used in the Plant Screening Tests

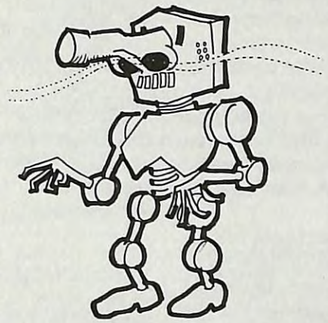
Benzene
A very commonly used solvent and is also present in many basic items including gasoline, inks, oils, paints plastics, and rubber. It irritates the skin and eyes.

Trichloroethylene (TCE)
A commercial product with many industrial uses. It is used for metal degreasing and dry-cleaning as well as in printing inks, paints, lacquers, varnishes and adhesives.

Formaldehyde
Found in virtually all indoor environments. Major sources include urea-formaldehyde foam insulation and particle board or pressed-wood products as well as many consumer paper products including grocery bags, waxed papers, facial tissues and towels which are treated with urea formaldehyde resins. Many common household cleaning agents contain formaldehyde. Other sources of formaldehyde include cigarette smoke and heating and cooking fuels such as natural gas and kerosene.

Summarized from a paper titled "Interior Landscape Plants For Indoor Air Pollution Abatement" by B.C. Wolverton, Ph. D. Keith Bounds, M.S. National Aeronautics and Space Administration, Stennis Space Centre

Managing Indoor Air Quality: a manual for property managers



The indoor air quality issue has come to the fore, as environmental awareness has increased. People have greater expectations for the environments in which they spend much time- be it at home or work.

What can be expected has been influenced by the the success of home programs such as the R-2000 Program, which from the outset stressed a whole *house-as-a-system* approach, including indoor air quality.

In the commercial sphere air quality problems have been commonly referred to as the *sick building syndrome*. In the commercial field, the consequences are severe as it impacts on the health of many and affects worker productivity.

Diagnosing air quality problems can be difficult, as there are many sources contributing to indoor air pollution and the composition of the offensive gases is variable. Individual responses are unique to the individual.

The seriousness of the situation in many commercial buildings is such that large property managers are looking at ways to deal with the situation. The Federal government, the largest tenant in Canada, has had to face the situaton in a number of buildings it occupies. Public Works Canada, as landlord or property manger, has produced a manual for its building managers, outlining the steps to take to assess the problems. It includes a section on the background of the problem, recommended management strategies to reduce the potential for indoor air quality problems, and offers a detailed checklist for a walk-through inspection

The manual is available to anyone willing to shell out $85.00 If you are involved strictly in the single family market, this is not for you. But if you have an interest in air quality issues for commercial and multi-tenant properties, as a consultant, manager, building official or designer, you will find this manual a handy reference.

Managing Indoor Air Quality: a manual for property managers *$85.00 (plus GST) available from the Institute for Research in Construction, National Research Council, Ottawa, Ont. K1A 0R6 Fax: (613) 954-5984*

EMR/CANMET NEWS

The Canada Centre for Mineral and Energy Technology (CANMET) is the research and development arm of Energy, Mines and Resources. EMR/CANMET's Buildings Group works with industry to develop and commercialize the technologies to make Canadian houses more energy efficient. With the support of the Buildings Group, Solplan Review presents this information on some current CANMET projects. For more information contact: Energy Efficiency Division, EMR/CANMET, 580 Booth St., Ottawa, K1A 0E4.

Combustion and Carbonization Research Lab

The Buildings Group isn't the only CANMET division whose work aids the residential construction industry. Work carried out by the Combustion and Carbonization Research Lab (CCRL) and in particular the Energy Conservation Technology section (ECT), affects builders and renovators alike.

The CCRL's goals are to increase fuel efficiency, ensure safe operation, lessen environmental impacts and integrate improved, fuel efficient technology into new efficient systems. The reduction of emissions of incomplete combustion products such as carbon monoxide, nitrous and sulphur oxides, soot and other particulates are inherent to CCRL's goals.

At a time when builders are under increasing pressure to construct more energy-efficient and environmentally sound structures, the work of the Lab has never been more important.

"Our mission has been the same since the Lab came into being in the 1950's" says Skip Hayden, who heads up the ECT section "and that's to maximize the efficiency of combustion equipment, while minimizing emissions that affect both indoor and outdoor air quality."

Working independently, or in conjunction with industry, the Lab develops combustion technologies, offers technical expertise and works closely with national codes and standards organizations. Recent focus has been on retrofit packages and the development of combined space and hot water systems for both oil and gas fuels, including:

Retrofit Condensing Gas Furnace

CCRL has developed a prototype retrofit heat exchanger that can be added to an existing conventional furnace. The unit boosts furnace efficiency from 60% to 96%.

Advanced Oil Furnace

An advanced oil furnace design developed as a retrofit for existing equipment which raises the seasonal efficiency of a forced or induced draft furnace from 60% to 85%.

Integrated Gas Space and Water System

An integrated system which results in energy savings of between 33% and 45%, with CO_2 reduction in the same order.

Wood Stoves

CCRL is developing wood stoves which reduce greenhouse emissions by 90% compared with conventional wood burning appliances.

For the construction industry, the development of these new technologies will have a number of impacts. "On the positive side," says Hayden, "builders can boast of homes with lower heating costs and reduced emissions which contribute to global warming, acid rain and local air pollution.

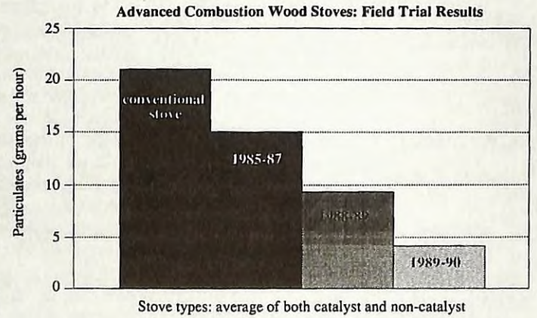
In addition these systems are ideally suited to the lower space heating requirements of low-energy housing and will give builders and renovators a whole new range of options for heating houses."

At the same time installation of the new equipment will also mean changes to how builders build and renovators renovate. "In the future" Hayden notes, "combustion equ ipment will have to be treated as an integral part of house design and operation, not just something that the builder drops in at the last moment." At the CCRL that future is just around the corner.

Clearing the Air: A New Wood Stove Standard

"Wood." says Ron Braaten, a physical scientist with the Combustion and Carbonization Research Laboratory, "is a great energy source. It's renewable, it's abundant, and it leaves little waste. Unfortunately, wood burning produces a number of emissions that have an adverse effect on the environment.

That "effect" has been enough to have had the installation of woo-



Manufacturers of state-of-the-art equipment have improved their emmission rates. The new CSA standard will further improve the "state-of-the-art" and give all manufacturer something to aim for.

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A new compact version of the National Building Code has been published. It's a complete edition of the NBC but in a smaller more compact format that's easier to handle (and take to the job site). It fits easily into a briefcase or glove compartment.
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Advertisements for products or services that would be of interest to SOLPLAN REVIEW readers. Reach over 4,800 members of the Canadian home building industry through a classified add in SOLPLAN REVIEW. Contact us for details. box 86627 north vancouver, b.c. V7L 4L2. FAX (604) 689-1841

BACK ISSUES SPECIAL
We still have some back issues of SOLPLAN REVIEW. Individual copies of back issues are available for $4.00 each, post paid.

PACKAGE DEAL: We have a special deal on back issues if you are missing a number of them: we'll send a package containing all available issues from No. 4 to 36 (there are a number out of print), but in any case there will be at least 20 issues for only $ 40.00 (plus GST); USA and other foreign $50.00.

the drawing-room graphic services ltd.
box 86627 north vancouver, b.c. V7L 4L2

Canada Post Does it Again!

We've just learned that our postal rates have gone up over 100% effective March 1, 1992. (with less than 30 days notice!).

I've been scolded for spending too much time on commentary related to problems with Canada Post. But we've got to let you know about this one as such a dramatic change is going to have a major impact on our costs and it will affect your subscription rates.

When we've had a chance to evaluate the impact we'll advise our readers. Those with current subscriptions can rest assured that we will honour all subscriptions for the duration. RK

Publishing Schedules

Some observant readers may have noted that our publishing schedule has been a bit erratic the last two issues. We know you notice, as some have even called to check about expiry dates on their subscription! We've glad to see we are missed if we don't show up on time.

The delays arose because we have been confronted with several deadlines on other projects, so the whole office staff has been overwhelmed trying to get everything done on time, but inevitably something falls behind. We thing that we're slowly getting caught up, and will be getting close to our original publication schedules.

Sorry for any inconvenience, and for your understanding. RK

Building Code Code Changes

Proposed changes to the National Building Code are now available for public review and comment. This is the first round of comments for the 1995 edition. Comments must be made on a prescribed form and must be received by April 30, 1992.

This is your chance to have some input in the code process - if you don't act now, then you might be surprised later on. If you don't have the time, make sure that your local technical committee does!

To request packages of proposed changes or for more information contact *the Secretary, Canadian Commission on Building and Fire Codes, Institute for Research in Construction, National Research Council of Canada, Ottawa, Ontario, K1A 0R6. Phone (613) 993-9960*

The Advanced Houses Program Update

We are about to embark on a very exciting adventure in this country, with the construction of a series of advanced technology houses each demonstrating innovations in housing.

Why bother? Aren't houses complex enough already? Some may think that we've already made them too complex, and difficult to handle - too high-tech, so why encourage more research and development? The fact is we still can't build them properly. We still manage to screw things up, so there is lots of room to improve.

The Advanced Houses program, spearheaded by EMR's CANMET Buildings Group, is a unique opportunity in that a series of houses in varying regions and climates will be built. Each will have a unique local flavour while meeting goals common to all.

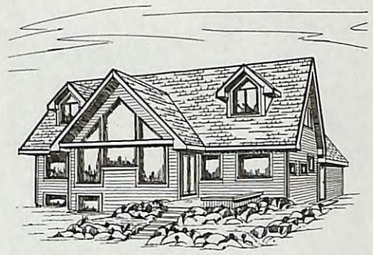
Energy efficiency and environmental concerns are the driving forces, as the program is part of EMR's Green Plan initiatives.

The goals of the program are for energy consumption to be less than 50% that of the current R-2000 targets. Special attention is also being paid to total energy consumption in the house, not just for space heating but also for household appliances. Appliance energy consumption becomes significant as the building envelope is tightened and space heating energy consumption is decreased.

Environmental concerns

Energy and resource conservation is very much related with environmental friendly construction. The energy consumption that is to be used is not only the energy to maintain the building in operation and habitable, but also in the processes that bring the materials to the site.

Materials that have a high recycled content may have a lower impact on the environment. The Advanced houses will use a range of products that could thus be classed as "environmentally friendly".



B.C. Advanced House

The **B.C. Advanced house** to be located in Langley, B.C. will make use of non-chemically treated wood for the foundation, cement based materials with low-grade or recycled wood fibres for cladding, roofing and floors. The products are chemically inert, fireproof, inexpensive to produce and durable.

The basic structure will use stressed skin panels. These offer high insulating values in a thinner panel (thus saving on space in the house) and reduce construction waste produced on-site. It will use an integrated home automation system using the CEBus system, which is an open automation standard being developed in North America.

All the household appliances (refrigerator, stove, washer, dishwasher, dryer) will be energy misers compared to conventional appliances now on the market.

fired equipment banned in some areas; and, according to Braaten, brought an important Canadian fuel source to the brink of social unacceptability. However, the Canadian Standards Association is about to release a new standard for wood-fired appliances (CSA B415), which should help clear the air.

"Simply stated," says Braaten, "CSA B415 provides a uniform method of determining the emissions and efficiency of a wide range of domestic wood-fired appliances (including wood stoves, pellet stoves and fireplace inserts), and sets minimum performance requirements that those appliances must meet."

In addition to higher efficiencies and reduced emissions, the new standard should also help reduce indoor air pollution and reduce the incidence of creosote chimney fires. For manufacturers, the new standard gives them a tool to help demonstrate the quality of their product.

For builders, the standard gives them a tool to compare and choose between equipment on the basis of efficiency and environmental performance. That in turn allows builders to demonstrate the quality of equipment in their own product - houses.

As with other CSA wood-fired appliance requirements, CANMET played a large role in the development of the standard. CANMET funding paid for the time of CSA staff engaged in activities related to the standard. CANMET's Combustion and carbonization Research Laboratory prepared the first draft of the standard as well as draft modifications.

CCRL's laboratory resources were used for testing of the standard to verify the appropriateness of some of the proposed requirements. For the time being, testing to the new standard will be carried out on a volunteer basis only, but Braaten sees the day, in the not-too-distant future, when meeting the standard will be a requirement. "Wood is simply too important an energy source," he says. "And the more we use, the better off we'll be." It is rumoured that three provincial jurisdictions are already set to introduce the new standard as mandatory.

Each will be tied into the home automation system, so that it will be able to "talk" to each other to avoid simultaneous power draws that could overload the electrical system and blow fuses.

Because of the integrated nature of the electrical system, the electrical system proposed will be a 60 amp service (compared to the standard 100 or 200 amp service that would be the norm for this size of house).

The **Saskatchewan Advanced House** in Saskatoon will feature an integrated heating, cooling and ventilation system. It will include a prototype heat recovery ventilator, heat recovery from waste water, and solar domestic hot water system.

Prince Edward Island Advanced House

The **Prince Edward Island Advanced House**, located outside Charlottetown, stresses the use of renewable energy resources for space heating. Most of the home's energy will be generated by a windmill and a photovoltaic system (converting sunlight directly into electricity) . A ground source heat pump will be incorporated.

Hamilton Advanced House will feature a gas powered integrated system for space, water and ventilation, as well as a complete home automation system. The most interesting feature will be a removable granny flat that will be installed inside the garage.

The **maison performante** to be built in Longueil, Quebec, combines passive solar energy with a ground source heat pump using radiant floor heating, insulating glass blocks and wall board containing recycled newspaper.

The **Nova Scotia Advanced House** in Bedford, N.S. is a two storey home compatible with its neighbours that incorporates passive solar design, a prototype ground source heat pump, CO_2 controlled ventilation system, and photovoltaic powered hot water system.

The **Manitoba Advanced House** in Winnipeg will include a prototype air filtration system, power meters to help residents monitor their power use, a split stud wall system and domestic hot water preheat system.

The **Innova House** in Ottawa will be a showcase for environmentally friendly building components, CFC free foam insulation and an integrated heating, cooling, ventilating and hot water system.

The **Waterloo Green House** in Waterloo, Ont. explores a range of environmentally responsible approaches to construction from extensive use of components made from recycled materials to elimination of waste products going to landfill sites during construction.

The **New Brunswick Advanced House** in Fredericton demonstrates ways of minimizing the impact of housing on the environment through the use of a shallow foundation, domestic sewage treatment plant and environmentally sensitive landscaping. It incorporates a ground source heat pump, in-floor radiant heating and high performance windows.

Each of the teams includes many participants from the housing industry in their area. To contact any of the Advanced House teams:

B.C. Advanced House
contact: Richard Kadulski tel: (604) 689-1841
Saskatchewan Advanced House
contact: John Carroll tel: (306) 955-6677
Manitoba Advanced House
contact: Don Glays tel: (204) 477-5110
Waterloo Green Home
contact: Stephen Carpenter tel: (519) 884-6421
Hamilton Advanced House
contact: Don Buchan tel: (613) 748-3762
Innova House
contact: Bruce Gough tel: (613) 723-5907
Maison Performante
contact: Hugh Ward tel: (514) 353-1120
New Brunswick Advanced House
contact: Hazen Spinney tel: (506) 458-9840
Nova Scotia Advanced House
contact: Richard Miller tel: (902) 445-2000
P.E.I. Advanced House
con: Norm Finlayson tel: (902) 368-3303

Solar Heating in Antarctica?

For those who still doubt the viability of solar energy for heating, the following should give pause for thought.

The U.S. Research Program has three stations in Antarctica, one at the South Pole where the mean annual temperature is -49°C, while summer temperatures may reach a balmy -18°C.

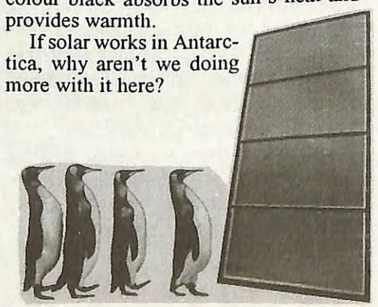
The South Pole Station is only occupied during the six months of sunlight. With 24 hours of sunlight and all walls facing north towards the sun, solar heating is a natural to consider.

Designing a solar heating panel to work under these conditions is not simple as there's little practical experience in Antarctica. **Conserval Systems Inc.** of Toronto has had projects in Canada's north, so it was awarded a contract to supply 20 air solar panels for a new residence being built at the South Pole.

Their panel design was modified to increase efficiencies and to produce heat even when ambient temperatures dropped below -51°C. The panels are scheduled to be installed in late 1992.

It's expected that future Antarctic buildings will also be solar heated, confirming what the penguins knew all along, that the colour black absorbs the sun's heat and provides warmth.

If solar works in Antarctica, why aren't we doing more with it here?



Technical Research Committee News

Canadian Home Builders' Association

Energy Building Code

A new Energy Code is being developed, based on the Measures for Energy Conservation, a document first developed in the late 1970's. One of the suggestions that is being made is that every house be capable of meeting an airtightness test.

What do you think if every house you build had to pass an airtightness test done by a blower door? Could you live with it? Is there enough blower-door test units in your area? Do you feel this kind of a regulation is justified?

Now is the time to make your voice heard. Contact the TRC with your thoughts now, while the discussion is still going on.

CHBA is also looking at sections covering heating and ventilating systems. An annotated outline has been drafted. It comments on the proposed language and its implications to industry. Anyone wishing to see what is being proposed, or who wishes to make comments can contact Grant Wilson, c/o the TRC for a copy.

Code Ventilation Requirements

In the last issue we reported that prescriptive designs that meet code ventilation requirements are being prepared. The objective is to reduce the confusion that surrounds the issue in the mind of many builders and inspectors.

Ontario New Home Warranty Program along with CHBA and other industry groups have submitted draft changes for consideration by the Part 9 committee of the National Building Code. They expand on the brief paragraph that currently sets out the ventilation. The goal is to have simple, effective ventilation systems, spelled out in clear language.

The essential points being presented are as follows:

It is suggested that all dwellings be equipped with mechanical ventilation systems to supply and exhaust air from the house. The ventilation systems should be capable of supplying outside air continuously at a rate of 30 cfm for the master bedroom and 15 cfm for each other bedroom; the supply air to be distributed to each storey and basement, while exhaust air is extracted from any area but the basement. The air flow is based on recommended ASHRAE rates of 15 cfm per person for control of CO_2.

The supply air duct can be connected directly to the return air duct (a minimum of 8 feet from the furnace) in a forced warm air system. Calculations indicate that for furnace flow rates as low as 500 cfm and outside supply volumes as high as 75 cfm, the cold air, when mixed with indoor air in the ducts, will get preheated so the temperature at the furnace remains above 60°F for outdoor temperatures as low as -13°F.

The unobstructed openings in basements are eliminated, improving comfort, eliminating the need for supplementary heating of incoming air, and easier application on site.

Kitchen exhaust capacity is to be not more than 100 cfm, and bathroom not more than 50 cfm. These figures establish minimum requirements, and are intended to prevent excessive house depressurization caused by the operation of separate fans. Presence of naturally aspirating combustion appliances is noted.

Mechanical systems may be any type able to provide balanced air flows for supply and exhaust air. They may be separate fans, packaged ventilators, or may be designed to tie in with forced warm air heating systems.

The proposed regulations include specific instructions for ducted systems, including minimum duct sizes, static pressures at which fans are rated, noise criteria, dampers and controls. A note suggests that as packaged ventilators become more common, then the detailed regulations explaining good system design could be deleted.

Environmental Code of Practice

With the increased environmental concerns among the general population, and many builders' desire to be environmentally sensitive, discussion has started about developing an environmental code of (construction) practice. Do you have any thoughts on this issue? Should CHBA pursue this type of position paper? What should it cover? is it premature?

The Technical Research Committee (TRC) is the industry's forum for the exchange of information on research and development in the housing sector. Membership includes builder members and representatives from industry, standards and governments bodies with an interest in housing. Anyone with a problem, technical question of suggestions for areas that need to be investigated is encouraged to contact their local Home Builder's Association technical committee or the TRC directly. To contact the TRC:
Canadian Home Builders Association, 200 Elgin St. Suite 502, Ottawa, Ont. K2P 1L5
Tel: (613) 230-3060

You asked us

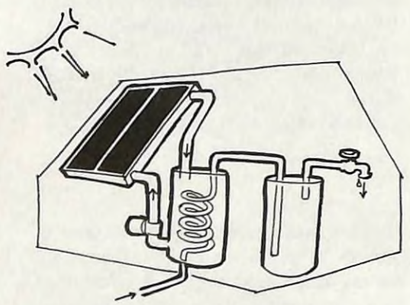
Are there any restrictions for using natural gas fireplaces in homes?

Gas fireplaces have become very popular in recent years. You don't have to chop wood and you don't have the mess associated with ashes.

Gas fireplaces are becoming such a fashionable item that any number of units can be put in the home. With the advent of the direct vent units with no need for flues, even apartments can have their own fireplace.

So is there any restriction? Installation codes require that only direct vent units can be installed in bedrooms or bathrooms. Otherwise, the installation follows normal practices.

Units that are not direct vented must have flues, however, venting requirements mean that the vent must remain open at all times.



What is the current availability of Solar Domestic Hot Water heating systems?

Solar domestic hot water heating systems can provide a significant portion of the hot water needs of the typical household. The solar contribution will vary depending on the time of year, with almost 100% solar during the summer months and a much smaller contribution in the depths of winter, but on average for typical household use about 50% of annual hot water needs can be contributed by the sun. Obviously, the solar fraction will depend on system design, hot water loads, etc.

In recent years, the demand for solar water systems has diminished because of the very low energy prices in this country. Only in the high energy cost areas, such as Atlantic Canada, can an economic argument be made that is somewhat favourable for solar. When the purchaser of the solar system must pay retail prices for the systems and installation, payback for the solar system can be 15 - 20 years or more, the economics are not there.

The major argument in favour of solar installations is that they are environmentally friendly, reducing demands on conventional energy resources.

Where there are large water loads, especially a seasonal loading (such as swimming pool heating), then solar looks much more attractive. Typical outdoor swimming pools can have a payback as short as 3-4 years even in such low energy cost areas as Vancouver.

In the late 1970's and early 1980's there were a number of companies in Canada and the USA manufacturing solar hot water heaters. In the USA the bottom fell out of the market when tax credits for solar installations were cancelled. (In effect, people were buying tax credits, not solar equipment).

The situation in Canada was a little different, but some of our companies had significant export sales that dried up at the time. At the moment, there are 2 Canadian companies we are aware of that are still manufacturing Solar domestic water heating systems in Canada:

Thermo Dynamics Ltd.
81 Thornhill Dr.,
Dartmouth N.S. B3B 1R9
Tel: (902) 468-1001 Fax:(902) 468-1002

Solcan Ltd.
885 Sarnia Rd, R.R. #3 London, Ont.
N6A 4B7
Tel (519) 473-0501

A solar collector using vacuum tubes, and manufactured in the United Kingdom is distributed by:

Thermomax 6702 Rajpur Place,
Victoria, B.C. V8X 3X1
Tel: (604) 652-6002 Fax (604) 652-5351

For more information on solar energy applications, contact:

Solar Energy Society of Canada Inc.
#420 - 301 Moodie Dr. Ottawa, Ont.
K2H 9C4
Tel (613) 596-1067

William M.McCance Award

Richard Kadulski, your editor, was honoured with the William M. McCance award which is given by the Canadian Home Builder's Association in *recognition for outstanding contribution to the Canadian Housing Industry in the technical area.* The award was presented at the 1992 CHBA Convention held in Winnipeg,

Letters to the Editor

Sir,

I read in the newspaper that you received an award from the Canadian Home Builders Association for your SOLPLAN REVIEW.

I wanted to add on a personal level that we at Britco also have a high regard for your publication. Keep up the great work!

Britco Structures
David W. Taft
Director of Operations

Sir,

Re: *Energy Efficiency of Residential Fans*, SOLPLAN REVIEW (Dec/Jan 1992)

References to the relationship between power factor and efficiency in the article are incorrect and misleading. Power factor is not a term to describe efficiency.

Power by definition is the *"ability to do work"* = kw (kilowatt)

kvA (kilovolt-ampere) is *not* power

kvAR (kilovolt-ampere reactive) is *not* power

energy = kWh (kilowatt hour)

Most utility meters used for billing purpose in industry measure kWh, kw and kvAR separately. Some measure kvA. Residential meters usually measure only kWh.

C.A. Day, P.Eng
B.C. Hydro
Vernon, B.C.

This is not the only comment we received on this subject. The error crept in as we tried to present a complex idea in simplified terms, and I guess we went too far the wrong way. The point is that all is not as simple as it seems. There is a total system to be considered, not just the number of kilowatts saved.

Thanks for bringing up the matter and making the correction.

Sir,

Along with my renewal (enclosed) I am replying - obliquely - to your invitation to comment on how you might improve your publication.

My comments do not concern the content of SOLPLAN REVIEW, which I always look forward to reading when a new issue arrives; rather they pertain to the form, specifically the English. I have just finished re-reading No. 41, after receiving it back from a friend (who is a municipal building inspector). May I point out from this issue some of the lapses which annoy me as I read:

"a well built house is safe and healthy...." Living organisms are healthy; houses, foods, etc. are healthful (words used imprecisely).

"underfloor ducts which carried warm air that warmed the floors which in turn . . " The use of relative pronouns one after the other like this creates a numbing, house-that-Jack-built type of sentence whose structure really detracts from its message. It may have been intentional; was it?

"these heaters are usually small in size . . . " "small" always refers to size, so the "in size" is totally redundant, just as "red in colour" would be. The "tubular in shape" which follows "small in size" is fine because tubular could refer to construction as well as shape.

Generally speaking, in spite of the examples I've pointed out, I find the quality of writing good in your magazine. The sort of mental backtracking necessitated by such misplaced adverbs is annoying at best; at worst it can lead to faulty interpretation.

R. Baldwin
Hay River, NWT

The 6 page letter points out a series of other typographic and grammatical errors. There's no getting away with it, we're guilty.

At the risk of sounding like an excuse (which it is) we often find ourselves working to a deadline. To avoid falling behind we rush the publication to the printer without doing adequate proofreading.

I appreciate being reminded of this lapse, and will try to see that it doesn't happen too often (being a mere mortal, I suspect errors and omissions will happen from time to time). It's nice to know that we have readers who take the time to read and scrutinize closely what we publish.

Thanks for your comments. RK

Whiter than White? Brighter than Bright?

Comparing appliances

We often hear tales about how superior European appliances are. But also for many years there has been a widespread opinion that although European dishwashers and clothes washers used less energy, they provided less consumer satisfaction so that they were not desirable for use in North America.

To try and find out where the truth lies, tests were developed to compare the performance and energy consumption of a North American and a European clothes washer and dishwasher. The research was conducted by ORTECH for Ontario Hydro.

Clothes washers

Clothes washers using a consistent fabric load and natural soiling, North American and European wash detergents were used to avoid biasing the results, but the findings are based on limited testing of only one North American and one European appliance.

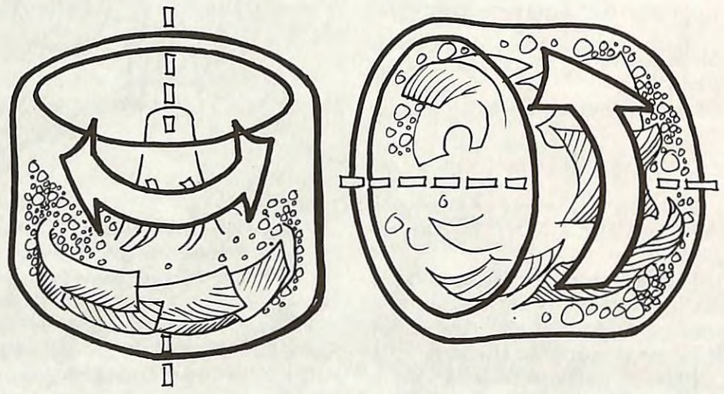
A clothes washer representative of the North American marketplace and one typical of the European marketplace were selected.

The North American model used was a "middle of the line" unit, one of the most popular sellers according to the retailer. The test unit was a stock appliance taken off the showroom floor; it was not specially selected or prepared. It is designed for hookup to 120v AC, 60 Hz.

The washing performance for the European machine was consistently and significantly better than for the North American machine, for both the European and North American detergent.

The European washer, made in West Germany, was also a "middle of the line" model in its home market. It can operate with cold only or hot/cold water hookup, and is designed for hookup to 240v AC, 60 Hz, or 220v AC, 50 Hz.

The energy consumption of the European machine was found to be 75% lower (1.06 kWh vs 4.47 kwh), and water consumption was found to be 40% lower (102 litres vs 168 litres) than the North American machine for a "normal washing cycle". Suggested detergent amounts were also found to be 60% lower for the European machine. However, the cycle time for the European machine was longer at 99 minutes compared with 39 minutes for the North American unit.



European and North American clothes washers have developed into distinctly different products. North American washers are designed to be connected to a central domestic hot water and cold water supply. They generally are not equipped with a water heating capability. By contrast, European machines are commonly connected to a cold water hookup only and have internal water heaters to boost the water temperature when required. European machines are capable of using higher water temperatures when desired than would be safe for central storage tanks in Canadian homes.

The European clothes washer demonstrated superior cleaning performance in the normal cycle, using only ¼ the energy and 2/3 the detergent.

Why the difference?

A comparison of the washing methods is useful to explain the contrast. The vertical axis North American machine fills the wash tub with 81 litres of 60°C water during the washing step and mechanically agitates the completely submerged load through the water. The horizontal axis European machines use 13 litres of cold water which is heated in the washer to 60°C during the wash. The clothes are not submerged, but are tumbled up and out of the shallow water level as the detergent is dissolved and distributed throughout the load.

The European machine also removed 7% more water during its final spin cycle than the North American machine. Part of this is explained by the spin speed of 800 rpm compared to 425 rpm for the North American model.

The smaller amount of wash water, and corresponding reduction in energy required for water heating by the European washer accounts for most of the energy difference between the two machines.

The CSA and DOE energy standards do not assign an energy credit for reductions in water retention by the clothes load, although wetter clothes will require extra energy in the clothes dryer. A typical electrical clothes dryer with an Energuide rating of 85 kWh/month consumes about 2.6 kWh per cycle reduction therefore would approximately correspond to an 8% reduction in rated clothes dryer energy consumption.

Dishwashers

A comparison of dishwashers noted similar results. While using 33% less energy, 45% less water and 50% less detergent, the European design exhibited essentially equal washing performance with only a slight increase in cycle time for 60 to 80 minutes.

The test method used for the dishwashers is much more demanding than the average household would apply.

Looking at the two design approaches, what does it mean for consumers? From an energy and resource use perspective, there is no doubt that the Europeans have taken the proper better route. If North American appliance makers took lessons from the Europeans, and applied them to new products, users would suffer little inconvenience while gaining substantial environmental, energy and financial benefits.

It is hoped that programs such as the Advanced houses program will help spur the marketplace, alerting the public to what is possible. At the same time, that manufacturers are spurred on to bring out new and better appliances.

Washability and Energy Use Evaluation of a North American and European Clothes Washer; Washability and Energy Use Evalation of Residential Dishwashers. Two studies prepared by ORTECH International for Ontario Hydro.

Ontario Wall Drying Project

Excessive construction moisture in wall assemblies is known to have adverse effects, including warping or twisting of framing members; a reduction in the effectiveness of the thermal insulation; paint peeling; mould, mildew and deterioration of wood.

To avoid these problems the building code specifies that the moisture content of lumber shall not be greater than 19% at the time of installation.

Although builders know the problems that can be caused by moisture, it is not always possible to avoid using wet lumber. In fact, wet lumber is routinely installed because dry lumber is not always available or it's not always possible for builders to refuse lumber delivered to the site.

If building with wet lumber is inescapable, one alternative is to use wall systems that are better able to handle this moisture. To look as this situation, the Ontario Wall Drying Project looked at ten different wall types in relation to their ability to dry out. Factors affecting the drying rate of framing lumber and the effect of wet framing lumber on wall performance were explored.

Wood stamped KD means that the wood has been kiln-dried. Wood stamped S-DRY means that wood has been air dried or kiln dried. Wood stamped S-GRN is intended to dry in place. Using kiln-dried or D-DRY lumber is one of the best ways to reduce moisture loads in walls.

Twenty-four wall panels (each 8' by 4') consisting of ten different wall types using a variety of sheathing and cladding materials were built into a test building at the University of Waterloo. All framing lumber had a starting moisture content over 19%, (generally 28 to 30%). (table p. 16)

The stud lumber exhibited a two-stage drying pattern. Drying was very fast until it reached the 20 to 23% range. At that point, the drying process slowed considerably until the moisture content gradually reached an 'equilibrium' level. In every case, this equilibrium level was well below the 19% required by the code.

Sheathing was the main component variable in the test program. Wall sheathed with glass fibre board sheathing dried the fastest, while isocyanurate board was the slowest. Orientation had little effect on the drying rates.

Some builders try to compensate for wet lumber by allowing it to stand open for a week or two. The framing in one set of test panels was covered but not closed-in for ten days. Delayed closing does not contribute to quicker drying of the construction.

Size of stud: All else being equal, the moisture load of 2 x 6 construction will be 50% greater than 2 x 4. Builders of 2 x 6 wall will need to pay more attention to using dry lumber.

Sheathing: Insulating sheathing helps maintain temperatures behind the sheathing and within the stud space. This provides an advantage over non-insulating sheathings.

Brick veneer reduces the temperature extremes due to solar radiation and wind in the wall. When combined with insulating sheathing it has a slight advantage over the use of non-insulating sheathing and a light-weight, contact-attached cladding, such as vinyl, aluminium, or even a wood-based siding.

Air leakage to the exterior is an important mechanism for moving moisture out of walls. It is particularly important when sheathing materials with low vapour permeability and low storage capabilities are used.

Special attention should be given to flashing details at the top of the basement wall, and to the slope of the grade, to keep water away from the lower plate.

Using preserved wood for the bottom plate will minimize risks associated with construction moisture.

The Ontario Wall Drying Project was funded by CMHC and several industry groups. A comprehensive technical report can be obtained from:
Canadian Housing Information Centre
Canada Mortgage and Housing Corporation, 700 Montreal Rd Ottawa, Ontario K1A 0P7

Ontario Wall Drying Project: wall assemblies tested

Framing	Sheathing	Exterior
2x6	½ gypsum board	building paper, vinyl siding
2x6	7/16 fibreboard	building paper vinyl siding
2x6	7/16 fibreboard	building paper vinyl siding
2x4	1 ½ semi-rigid fibre glass insulation board & Tyvek	taped joints vinyl siding
2x4	1 ½ type 4 extruded polystyrene shiplapped and butted	building paper vinyl siding
2x4	1" polyisocyanurate, butted	building paper vinyl siding
2x4	1 ½ semi-rigid glass fibre insulation board & Tyvek	tapped joints clay brick
2x4	7/16 fibreboard	building paper clay brick
2x4	7/16 waferboard	building paper clay brick
2x4	1 ½ semi rigid glass fibre insulation board & Tyvek	tapped joints vinyl siding
2x4	1 ½ type 4 extruded polystyrene shiplapped and butted	building paper clay brick
2x4 (delayed close)	1½ type 4 extruded polystyrene shiplapped and butted	building paper clay brick
Fibre glass insulation friction fitted between studs, all panels sealed with 6 mil poly and covered and ½ gypsum board on interior.		